[0007] The object of this invention is to provide a silver-coated material of excellent abrasion resistance in which, even when used as, for example, a moving contact and/or a fixed contact in a switch used over an extended period of time under conditions where switching is repeatedly carried out, the silver or silver alloy layer at the surface does not wear away and, moreover, the contact resistance does not rise.

[0008] The inventors have conducted extensive investigations, as a result of which they have discovered that the above problem is resolved by the use of plating to form, as an outermost layer on an electrically conductive base material, a layer made of at least silver or a silver alloy, and heat-treating under specific heating conditions. This discovery led ultimately to the present invention.

[0009] The invention is recited below.

(1) A silver-coated material having a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, wherein crystals of a columnar structure having an average crystal grain size of 0.2 μm or more and 0.5 μm or less that are made of silver or a silver alloy are included in the layer made of silver or a silver alloy, and wherein ~~this~~ the silver-coated material ~~having~~ has a coating loss, in an abrasion resistance test, of less than 40 mg and ~~having~~ has an initial contact resistance of less than 10 mΩ and a contact resistance of less than 10 mΩ after a sliding wear test carried out under following conditions.

Sliding wear test conditions:

[Load]	1.6 N
[Sliding range]	0.2 mm
[Sliding speed]	1 mm/s

[Number of cycles] 50,000

[0010] (2) The silver-coated material according to (1) above, characterized in that the coating loss in the abrasion resistance test is less than 30 mg.

[0011] (3) The silver-coated material according to (1) or (2) above, characterized in that the abrasion resistance test is carried out in accordance with JIS H 8682 under conditions of a load of 500 gf (surface area of abrasion, 12 mm × 31 mm), with #1500 emery paper, and 200 back-and-forth cycles.

[0012] ~~(4) The silver-coated material according to any one of (1) to (3) above, characterized in that crystals of a columnar structure that are made of silver or a silver alloy are included in the layer made of at least silver or a silver alloy.~~

[0013] ~~(5) The silver-coated material according to any one of (1) to (4) above, characterized in that the silver or silver alloy crystals in the layer made of at least silver or a silver alloy have an average crystal grain size of 0.2 μm or more and 0.5 μm or less.~~

[0014] (~~6~~4) A silver-coated material having a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, wherein the layer made of silver or a silver alloy ~~being~~ is formed by plating and heat-treated at 200 to 500°C for 1 to 299 seconds.

[0015] (~~7~~5) The silver-coated material according to ~~(6)~~ (4) above, characterized in that crystals of a columnar structure that are made of silver or a silver alloy are included in the layer made of ~~at least~~ silver or a silver alloy.

[0016] (~~8~~6) The silver-coated material according to ~~(6)~~ (4) or ~~(7)~~ (5) above, characterized in that the silver or silver

alloy crystals in the layer made of ~~at least~~ silver or a silver alloy have an average crystal grain size of 0.2 μm or more and 0.5 μm or less.

[0017] (~~9~~7) The silver-coated material according to any one of ~~(6)~~ (4) to ~~(8)~~ (6) above, characterized in that the heat treatment is carried out at from 250 to 450°C for 1 to 59 seconds.

[0018] (~~10~~8) The silver-coated material according to any one of ~~(6)~~ (4) to ~~(9)~~ (6) above, characterized in that the heat treatment is carried out at from 270 to 450°C for 1 to 30 seconds.

[0019] (~~11~~9) The silver-coated material according to any one of ~~(6)~~ (4) to ~~(10)~~ (6) above, characterized in that the heat treatment is carried out at from 300 to 450°C for 1 to 10 seconds.

[0020] (~~12~~10) A switch, characterized by using the silver-coated material according to any one of (1) to ~~(11)~~ (9) above as a moving contact and/or fixed contact for the switch.

[0021] (~~13~~11) A method of manufacturing the silver-coated material according to any one of (1) to ~~(11)~~ (6) above having~~,~~ a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, ~~this~~ and wherein the method ~~including~~ includes a step of forming the layer made of silver or a silver alloy by plating, and heat-treating the same at from 200 to 500°C for 1 to 299 seconds.

[0022] (~~14~~12) The method of manufacturing the silver-coated material according to ~~(13)~~ (11) above, characterized in that the heat treatment is carried out at from 250 to 450°C for 1 to 59 seconds.

[0023] (~~15~~13) The method of manufacturing the silver-coated material according to ~~(13) or (14)~~ (11) above, characterized in that the heat treatment is carried out at from 270 to 450°C for 1 to 30 seconds.

[0024] (~~16~~14) The method of manufacturing the silver-coated material according to ~~any one of (13) to (15)~~ (11) above, characterized in that the heat treatment is carried out at from 300 to 450°C for 1 to 10 seconds.

[0025] According to this invention, there can be provided a silver-coated material of excellent abrasion resistance in which the silver or silver alloy layer at the surface does not wear away and, moreover, the contact resistance does not rise even when used as, for example, a moving contact and/or a fixed contact in a switch used over an extended period of time under conditions where switching is repeatedly carried out.

2. Brief Description of the Drawings

[0026] FIG. 1 is a cross-sectional SIM image of the silver-coated material in Example 1.

[0027] FIG. 2 is a cross-sectional SIM image of the silver-coated material in Comparative Example 1.

[0028] FIG. 3 is a cross-sectional SIM image of the silver-coated material in Comparative Example 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] The silver-coated material of this invention is a silver-coated material that has, as an outermost layer on an electrically conductive base material, a layer made of at least silver or a silver alloy, and is characterized by having a coating loss in an abrasion resistance test of less than 40 mg, and having an initial contact resistance of less than 10

WHAT IS CLAIMED IS:

1. A silver-coated material having a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, wherein crystals of a columnar structure having an average crystal grain size of 0.2 μm or more and 0.5 μm or less that are made of silver or a silver alloy are included in the layer made of silver or a silver alloy, and wherein ~~this~~ the silver-coated material ~~having~~ has a coating loss, in an abrasion resistance test, of less than 40 mg and ~~having~~ has an initial contact resistance of less than 10 mΩ and a contact resistance of less than 10 mΩ after a sliding wear test carried out under following conditions.

Sliding wear test conditions:

[Load]	1.6 N
[Sliding range]	0.2 mm
[Sliding speed]	1 mm/s
[Number of cycles]	50,000

2. The silver-coated material according to claim 1, characterized in that the coating loss in the abrasion resistance test is less than 30 mg.

3. The silver-coated material according to claim 1 or claim 2, characterized in that the abrasion resistance test is carried out in accordance with JIS H 8682 under conditions of a load of 500 gf (surface area of abrasion, 12 mm × 31 mm), with #1500 emery paper, and 200 back-and-forth cycles.

~~4. The silver-coated material according to any one of claims 1 to 3, characterized in that crystals of a columnar structure that are made of silver or a silver alloy are included in the layer made of at least silver or a silver alloy.~~

~~5. The silver-coated material according to any one of claims 1 to 4, characterized in that the silver or silver alloy crystals in the layer made of at least silver or a silver alloy have an average crystal grain size of 0.2 μm or more and 0.5 μm or less.~~

6. A silver-coated material having a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, wherein the layer made of silver or a silver alloy ~~being~~ is formed by plating and heat-treated at 200 to 500°C for 1 to 299 seconds.

7. The silver-coated material according to claim 6, characterized in that crystals of a columnar structure that are made of silver or a silver alloy are included in the layer made of ~~at least~~ silver or a silver alloy.

8. The silver-coated material according to claim 6 or claim 7, characterized in that the silver or silver alloy crystals in the layer made of ~~at least~~ silver or a silver alloy have an average crystal grain size of 0.2 μm or more and 0.5 μm or less.

9. The silver-coated material according to any one of claims 6 to 8, characterized in that the heat treatment is carried out at from 250 to 450°C for 1 to 59 seconds.

10. The silver-coated material according to any one of claims 6 to ~~9~~8, characterized in that the heat treatment is carried out at from 270 to 450°C for 1 to 30 seconds.

11. The silver-coated material according to any one of claims 6 to ~~10~~8, characterized in that the heat treatment is carried out at from 300 to 450°C for 1 to 10 seconds.

12. A switch, characterized by using the silver-coated material according to any one of claims 1 to 11 as a moving contact and/or fixed contact for the switch.

13. A method of manufacturing the silver-coated material according to any one of claims 1 to ~~11~~8 having~~,~~ a silver coating layer on an electrically conductive base material directly and/or via an underlayer~~, as~~, wherein the silver coating layer is an outermost layer ~~on an electrically conductive base material, a layer~~ made of ~~at least~~ silver or a silver alloy, ~~this~~ and wherein the method ~~including~~ includes a step of forming the layer made of silver or a silver alloy by plating, and heat-treating the same at from 200 to 500°C for 1 to 299 seconds.

14. The method of manufacturing the silver-coated material according to claim 13, characterized in that the heat treatment is carried out at from 250 to 450°C for 1 to 59 seconds.

15. The method of manufacturing the silver-coated material according to claim 13~~ or claim 14~~, characterized in that the

heat treatment is carried out at from 270 to 450°C for 1 to 30 seconds.

16. The method of manufacturing the silver-coated material according to ~~any one of claims~~ claim 13 ~~to 15~~, characterized in that the heat treatment is carried out at from 300 to 450°C for 1 to 10 seconds.